What is claimed is:

1. An optical amplifying method in which at least one optical amplifier is connected to an optical transmission line, an optical signal transmitted to said optical transmission line is amplified by said optical amplifier while an optical power of the optical signal on the optical transmission line is detected, and gain of the optical amplifier is controlled in response to an optical power of thus detected, the method comprising the steps of:

detecting an optical input and output power of said optical amplifier;

obtaining a difference between gain of said optical amplifier and target gain on a basis of detected optical input and output power;

implementing a proportional calculation and an integral calculation of said difference by an automatic constant gain control device to obtain a drive current of at least one pump laser diode provided in said optical amplifier; and

controlling gain of said optical amplifier by controlling current of said pump laser diode based on a calculated drive current value.

2. The optical amplifying method as claimed in claim 1, further including the steps of detecting an optical input power to said optical amplifier, and adjusting control parameters of said automatic constant gain control device in response to a detected result, wherein a drive current of said pump laser diode is obtained by the automatic constant gain control device with said control parameters adjusted.

3. The optical amplifying method as claimed in claim 2, wherein in said step of adjusting said control parameters, proportional constant of a proportional circuit in the automatic constant gain control device as said control parameters is adjusted.

4. The optical amplifying method as claimed in claim 2, wherein in said step of adjusting said control parameters, said optical input power from a optical device connected with said optical amplifying apparatus or said optical input power varied by add/drop function of an optical signal of wavelength division-multiplexing device in said optical device connected with said optical amplifying apparatus is detected, and the control parameters of said automatic constant gain control are adjusted in response to a detected result.

5. The optical amplifying method as claimed in claim 4, wherein in said step of adjusting said control parameters, proportional constant of a proportional circuit in the automatic constant gain control device as said control parameters is adjusted.

6. An optical amplifying method in which at least one optical amplifier and at least one wavelength division-multiplexing device are connected to an optical transmission line, an optical signal transmitted through said optical transmission line is amplified by said optical amplifier while an optical power of the optical signal on the optical transmission line is detected, and gain of the optical amplifier is controlled in response to an optical power of thus detected, the method comprising of the steps of:

inputting/outputting optical signals of prescribed wavelengths to/from said optical transmission line by said optical wavelength division-multiplexing device;

detecting an optical input/output power of said optical amplifier;

obtaining a difference between gain of said optical amplifier and target gain on a basis of detected optical input/output power;

implementing a proportional calculation and an integral calculation of said difference by an automatic constant gain control device to obtain a drive current of at least one pump laser diode provided in said optical amplifier; and

controlling gain of said optical amplifier by controlling current of said pump laser diode based on a calculated drive current value.

7. The optical amplifying method as claimed in claim 6, further including steps of detecting an optical input power to said optical amplifier, and adjusting control parameters of said automatic constant gain control device in response to a detected result, wherein a drive current of said pump laser diode is obtained by the automatic constant gain control device with said control parameters adjusted.

8. The optical amplifying method as claimed in claim 7, wherein in said step of adjusting said control parameters, proportional constant of a proportional circuit in the automatic constant gain control device as said control parameters is adjusted.

9. The optical amplifying method as claimed in claim 7, wherein in said step of adjusting said control parameters, said optical input power from an optical device connected with said optical amplifying apparatus or said optical input power varied by add/drop function of an optical signal of wavelength division-multiplexing device in said optical device connected with said optical amplifying apparatus is detected, and the control parameters of said automatic constant gain control are adjusted in response to a detected result.

10. The optical amplifying method as claimed in claim 9, wherein in said step of adjusting said control parameters, proportional constant of a proportional circuit in the automatic constant gain control device as said control parameters is adjusted.

11. An optical amplifying apparatus for amplifying an optical signal on an

optical transmission line comprising:

at least one optical amplifier amplifying an optical signal inputted into the optical transmission line;

an optical power detecting device for detecting an optical power of the optical signal on the optical transmission line;

a gain detecting device to detect gain of said optical amplifier;

a difference calculating device to obtain difference between a detected gain and a target gain; and

an automatic constant gain control device for implementing a proportional calculation and an integral calculation of said difference to obtain a drive current of at least one pump laser diode provided in said optical amplifier and controlling gain of said optical amplifier to be constant by controlling current of said pump laser diode based on a calculated drive current value.

12. The optical amplifying apparatus as claimed in claim 11, further comprises an adjusting device for adjusting control parameters of said automatic constant gain control device in response to a detected result of an optical input power to said optical amplifier which is detected by the optical power detecting device, the automatic constant gain control device with said control parameters adjusted controlling gain of the optical amplifier in response to optical input/output power detected by the optical power detecting device.

13. The optical amplifying apparatus as claimed in claim 12, wherein said automatic constant gain control device includes a differential circuit for subtracting gain of the optical amplifier from a target gain, that yields a difference between gain of the optical amplifier and a target gain, and a proportional circuit for multiplying proportional constant of the proportional circuit and said difference, and said adjusting device adjusts proportional

constant of the proportional circuit as the control parameters.

14. The optical amplifying apparatus as claimed in claim 12, wherein said adjusting device adjusts control parameters of said automatic constant gain control device in response to a detected result of said optical input power from an optical device connected with said optical amplifying apparatus detected by said optical power detecting device or said optical input power varied by add / drop function of an optical signal of wavelength division-multiplexing device in said optical device connected with said optical amplifying apparatus.

15. The optical amplifying apparatus as claimed in claim 14, wherein said automatic constant gain control device includes a differential circuit for subtracting gain of the optical amplifier from a target gain, that yields a difference between gain of the optical amplifier and a target gain, and a proportional circuit for multiplying proportional constant of the proportional circuit and said difference, and said adjusting device adjusts proportional constant of the proportional circuit as the control parameters.

16. An optical amplifying apparatus for amplifying an optical signal on an optical transmission line comprising:

at least one optical amplifier amplifying an optical signal transmitted through the optical transmission line;

an optical power detecting device for detecting an optical power of the optical signal on the optical transmission line;

a wavelength division-multiplexing device for add / drop function of an optical signal of a prescribed wavelength to/from said optical transmission line;

a gain detecting device to detect gain of said optical amplifier;

a difference calculating device to obtain difference between a detected gain and a target gain; and

an automatic constant gain control device for implementing a proportional calculation and an integral calculation of said difference to obtain a drive current of at least one pump laser diode provided in said optical amplifier and controlling gain of said optical amplifier to be constant by controlling current of said pump laser diode based on a calculated drive current value.

17. The optical amplifying apparatus as claimed in claim 16, further comprising an adjusting device for adjusting control parameters of said automatic constant gain control device in response to a detected result of an optical input power to said optical amplifier which is detected by the optical power detecting device, the automatic constant gain control device with said control parameters adjusted controlling gain of the optical amplifier in response to optical input/output power detected by the optical power detecting device.

18. The optical amplifying apparatus as claimed in claim 17, wherein said automatic constant gain control device includes a differential circuit for subtracting gain of the optical amplifier from a target gain, that yields a difference between gain of the optical amplifier and a target gain, and a proportional circuit for multiplying proportional constant of the proportional circuit and said difference, and said adjusting device adjusts proportional constant of the proportional circuit as the control parameters.

19. The optical amplifying apparatus as claimed in claim 17, wherein said adjusting device adjusts control parameters of said automatic constant gain control device in response to a detected result of said optical input power from an optical device connected with said optical amplifying apparatus detected by

said optical power detecting device or said optical input power varied by add/drop function of an optical signal of wavelength division-multiplexing device in said optical device connected with said optical amplifying apparatus.

20. The optical amplifying apparatus as claimed in claim 19, wherein said automatic constant gain control device includes a differential circuit for subtracting gain of the optical amplifier from a target gain, that yields a difference between gain of the optical amplifier and a target gain, and a proportional circuit for multiplying proportional constant of the proportional circuit and said difference, and said adjusting device adjusts proportional constant of the proportional circuit as the control parameters.

21. An optical amplifying apparatus for amplifying an optical signal on an optical transmission line comprising:

at least one optical amplifier for amplifying an optical signal transmitted to the optical transmission line;

an optical power detecting device for detecting an optical power of the optical signal on the optical transmission line;

an automatic constant gain control device for controlling gain of the optical amplifier to be constant; and

an adjusting device for adjusting control parameters of the automatic constant gain control device in response to a detected result of an optical output power from said amplifier which is detected by the optical power detecting device.

22. An optical amplified transmission system for amplifying an optical signal transmitted to the optical transmission line by a plurality of optical amplifying apparatuses connected in series including at least one optical amplifying apparatus which includes:

at least one optical amplifier amplifying an optical signal inputted into the optical transmission line;

an optical power detecting device for detecting an optical power of the optical signal on the optical transmission line;

a gain detecting device to detect gain of said optical amplifier;

a difference calculating device to obtain difference between a detected gain and a target gain; and

an automatic constant gain control device for implementing a proportional calculation and an integral calculation of said difference to obtain a drive current of at least one pump laser diode provided in said optical amplifier and controlling gain of said optical amplifier to be constant by controlling current of said pump laser diode based on a calculated drive current value.

23. The optical amplified transmission system as claimed in claim 22, wherein the optical amplifying apparatus further includes an adjusting device for adjusting control parameters of said automatic constant gain control device in response to a detected result of an optical input power to said optical amplifier which is detected by the optical power detecting device, the automatic constant gain control device with said control parameters adjusted controlling gain of the optical amplifier in response to optical input/output power detected by the optical power detecting device.

24. The optical amplified transmission system as claimed in claim 23, wherein said automatic constant gain control device includes a differential circuit for subtracting gain of the optical amplifier from a target gain, that yields a difference between gain of the optical amplifier and a target gain, and a proportional circuit for multiplying proportional constant of the proportional circuit and said difference, and said adjusting device adjusts proportional

constant of the proportional circuit as the control parameters.

25. The optical amplified transmission system as claimed in claim 23, wherein said adjusting device adjusts control parameters of said automatic constant gain control device in response to a detected result of said optical input power from an optical device connected with said optical amplifying apparatus detected by said optical power detecting device or said optical input power varied by add / drop function of an optical signal of wavelength division-multiplexing device in said optical device connected with said optical amplifying apparatus.

26. The optical amplified transmission system as claimed in claim 25, wherein said automatic constant gain control device includes a differential circuit for subtracting gain of the optical amplifier from a target gain, that yields a difference between gain of the optical amplifier and a target gain, and a proportional circuit for multiplying proportional constant of the proportional circuit and said difference, and said adjusting device adjusts proportional constant of the proportional circuit as the control parameters.

27. An optical amplified transmission system for amplifying an optical signal transmitted to the optical transmission line by a plurality of optical amplifying apparatuses connected in series including at least one optical amplifying apparatus which includes:

at least one optical amplifier amplifying an optical signal transmitted through the optical transmission line;

an optical power detecting device for detecting an optical power of the optical signal on the optical transmission line;

a wavelength division-multiplexing device for add / drop function of an optical signal of a prescribed wavelength to/from said optical transmission line;

a gain detecting device to detect gain of said optical amplifier;

a difference calculating device to obtain difference between a detected gain and a target gain; and

an automatic constant gain control device for implementing a proportional calculation and an integral calculation of said difference to obtain a drive current of at least one pump laser diode provided in said optical amplifier and controlling gain of said optical amplifier to be constant by controlling current of said pump laser diode based on a calculated drive current value.

28. The optical amplified transmission system as claimed in claim 27, wherein the optical amplifying apparatus further includes:

an adjusting device for adjusting control parameters of said automatic constant gain control device in response to a detected result of an optical input power to said optical amplifier which is detected by the optical power detecting device, the automatic constant gain control device with said control parameters adjusted controlling gain of the optical amplifier in response to optical input/output power detected by the optical power detecting device.

29. The optical amplified transmission system as claimed in claim 28, wherein said automatic constant gain control device includes a differential circuit for subtracting gain of the optical amplifier from a target gain, that yields a difference between gain of the optical amplifier and a target gain, and a proportional circuit for multiplying proportional constant of the proportional circuit and said difference, and said adjusting device adjusts proportional constant of the proportional circuit as the control parameters.

30. The optical amplified transmission system as claimed in claim 28, wherein said adjusting device adjusts control parameters of said automatic

constant gain control device in response to a detected result of said optical input power from an optical device connected with said optical amplifying apparatus detected by said optical power detecting device or said optical input power varied by add/drop function of an optical signal of wavelength division-multiplexing device in said optical device connected with said optical amplifying apparatus.

31. The optical amplified transmission system as claimed in claim 30, wherein said automatic constant gain control device includes a differential circuit for subtracting gain of the optical amplifier from a target gain, that yields a difference between gain of the optical amplifier and a target gain, and a proportional circuit for multiplying proportional constant of the proportional circuit and said difference, and said adjusting device adjusts proportional constant of the proportional circuit as the control parameters.

32. An optical amplified transmission system for amplifying an optical signal transmitted to the optical transmission line by a plurality of optical amplifying apparatuses connected in series including at least one optical amplifying apparatus which includes:

at least one optical amplifier for amplifying an optical signal transmitted to the optical transmission line;

an optical power detecting device for detecting an optical power of the optical signal on the optical transmission line;

an automatic constant gain control device for controlling gain of the optical amplifier to be constant; and

an adjusting device for adjusting control parameters of the automatic constant gain control device in response to a detected result of an optical output power from said amplifier which is detected by the optical power detecting device.